



UNIVERSITY OF DENVER *Solar Decathlon*

RESILIENCE
BUILD CHALLENGE

RESILIENCE

Resiliency and durability are significant challenges in the built environment that must be addressed comprehensively by the industry in the coming years. As we see significant growth in urban areas and impacts of climate change, it is imperative to identify affordable methods to sustainably protect existing residential buildings from adverse climate events of all types and prepare urban areas for greater population density.

Colorado outperforms most of the United State in job growth which translates into consistently high demand for housing and upward pressure on living and building costs. People who move to or are from Colorado tend to sway more towards environmental ideals than most others, this bumps up the desire to have as low of a HERS score as possible. The best way to construct Net-Zero homes in Colorado is usually to either bring it to its wood frame and then alter the structure or completely build a new one. New construction is the dominant approach to increase housing supply and overall density in urban environments. As this tends to be more cost-effective than renovating existing properties, current property owners needing to update their existing structures, both commercial and residential, are also impacted by the rising material and labor costs limiting their options to affordably renovate.

The City of Denver also faces more volatile climate demands as we face flash floods, long term droughts, snow storms, ice storms, intense cold fronts and heat waves. Throughout Colorado there are floodplain areas, this makes things difficult. This puts us at a predicament when it comes to altering existing designs or to building a new. There is a particular code that states that any new development/remodel needs to follow strict rules when building in these zones. For our project, since we were doing a remodel, we had a choice. Either have a 50 percent house value budget limited remodel (which was estimated to be a little over \$125,000) or to tear down the house, fill the basement and raise the foundation level. To overcome this, we have chosen to push this project well below the remodel fixed budget while also approaching the Net-Zero rating.

Remodeling is an art of its own kind. We plan to take a different approach being as selective as we can with the materials we get, and with that said we have been able to get just shy of half our overall budget as donations. This has helped us reduce the cost of our overall construction fees. If this project goes as planned, we will have put a little over \$65,000 (this is neglecting the \$16,075 for



tree removal) which is all in materials, donated and bought, as well as labor. This puts renovations into a new era. This will allow for residents to either remodel and have a solar generating home, or remodel and sell their home. This makes remodeling more viable and environmentally friendly compared to tearing down and building a new one. This increases construction costs and it also causes waste problems. With our particular house (one with asbestos) the costs would be even far greater, \$25,000 just for light remediation. Remodeling as minimally was the best viable option.

The root of our greatest challenge is due to the Floodplain Zone designated by FEMA. We are attempting to tackle this problem with innovations in multiple categories.

- ☑ We will be installing an energy analyzing system that will monitor the utilities of the house. This system will allow for the user to see how their house is performing daily, weekly and monthly.
- ☑ We will have created a Smart thermostat, Electric Consumption Monitoring, a Data analysis program and Data delivery center. This system allows the user to manipulate and monitor their energy consumption in order to meet their needs as an energy consumer. This lets the user meet their indoor climate and energy consumption desires while also giving them an analysis of past time. This educates the user and installs more environmentally conscious decisions about their individual energy consumption rates. This system will hopefully allow for the user to optimize their house to reach Net-Zero given the chance to perform.
- ☑ Additionally, we plan to prevent further flood zone prone problems and put in place mold prevention methods. The mechanical systems will be raised to protect them from any damage in case of a flood.
- ☑ We will be using wood finishes and refinished wood structural items. For fire prevention we are going off of the codes set by the city of Denver and are opting to not have a fire prevention system.
- ☑ Although we had a plan for a small battery/powerstation, the research and development had to end due to COVID and customer desire. Therefore we are not having a battery system, for we will be connected to the grid working with Excel. This allows the house to continually get power whenever Solar Generation isn't sufficient enough.

